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# PROCEEDINGS

OF THE

# ROYAL SOCIETY OF EDINBURGH.

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1836. No. 9.

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*Monday, 21st March* 1836.

Rev. Dr. **CHALMERS**, Vice-President, in the Chair.

The following gentlemen were duly elected Ordinary Fellows of the Society:

1. **David Rhind, Esq.**
2. **James Anderson, Esq.**

M. Dulong, formerly Perpetual Secretary of the Royal Institute of France, was elected an Honorary Member of the Society, in room of M. Stromeyer, of Göttingen, deceased.

The following Donations were presented:

**The Quarterly Journal of Agriculture; and the Prize Essays and Transactions of the Highland and Agricultural Society of Scotland. No. 31. for March 1836.—*From the Highland Society.***

**Catalogue of Recent Shells in the Cabinet of John C. Jay, M. D., Member of the Lyceum of Natural History, New York.—*From the Author.***

**Thirteenth Report of the Whitby Literary and Philosophical Society, presented at the Annual Meeting, October 31. 1835 —*From the Society.***

**The British and Foreign Medical Review, or Quarterly Journal of Practical Medicine and Surgery. Edited by John Forbes, M. D., F. R. S., and John Conolly, M. D.; January 1836 No. 1.—*From the Editors.***

Descriptive and Illustrated Catalogue of the Physiological Series of Comparative Anatomy of the Royal College of Surgeons in London. Vol. iii. Part 1.—*From the Royal College of Surgeons in London.*

Date

The following Communications were read:

1. Observations and Experiments on the Coloured and Colourable Matters in the Leaves and Flowers of Plants, particularly in reference to the Principles upon which Acids and Alkalies act in producing Red and Yellow or Green By Dr Hope, V. P. R. S. E., F. R. S. [Continued from 18th Jan.]

After premising some general remarks respecting the object of research, and enumerating the various authors who had written upon the subject, Dr Hope explained various terms which were to be used in the discourse. To the various coloured matters presented by the leaves and flowers of plants, De Candolle had applied the denomination of Chromule, which term he meant to adopt.

There resides in the same parts of plants, in addition to the chromule, some matter probably destitute of colour, which becomes red by the action of acids, and yellow or green by the action of alkalies. To it Mr Ellis gave the name of colourable matter, which the author changes to Chromogen. When an acid, added to a vegetable infusion, causes a red colour, and an alkali a yellow or green, it has been the universal opinion that both sets of agents act upon one and the same colourable principle. The leading object of this paper is to shew that the Chromogen, or colourable principle, is not an individual substance; and that there are two distinct principles, one which forms the red compound with acids, which he denominates Erythrogen; and another, which affords a yellow compound with alkalies, which he calls Xanthogen.

To establish that opinion, Dr Hope made many experiments on the leaves and flowers of plants, with various reagents, principally water, alcohol, acids, and alkalies; and has exhibited the results in the compendious form of tables. The first table presents the result of experiments on the leaves of many plants; and the general result from them, in regard to the special object of inquiry, is, that in addition to the green Chromule, denominated Chlorophyle by many writers, they all contain Xanthogen, and that none of them, excepting those which have some tint different from the green, contain Erythrogen.

The second table exhibits the result of the action of the reagents upon white flowers, all of which, to the number of about thirty, gave proofs of their containing Xanthogen, but no Erythrogen nor tinted Chromule of any kind.

The third table displays the results with yellow flowers, from which the general inferences are, that the yellow Chromule varies in its nature in different flowers; that all those subjected to experiment contained Xanthogen, and none of them Erythrogen.

The fourth table exhibits the experiments with red flowers, and affords the general conclusions, that while the red chromule shews considerable variety of character, red flowers contain both Xanthogen and Erythrogen in abundance.

The fifth table exhibits the results with twenty blue flowers, and presented the general observations, that the blue Chromule varies in its character in different blossoms, particularly in shewing very different degrees of solubility in water and alcohol, and in some producing coloured, and in others colourless, solutions in both menstrua; and that they contain both the colourable principles of Xanthogen and Erythrogen.

The sixth table relates to ten orange flowers, which equally shews that the orange Chromule differs much in one plant from another, and that they contain both colourable principles.

The seventh table relates to twenty purple flowers, and afforded the same conclusions as the preceding.

The eighth table exhibits the experiments made upon the tinted Chromule found in other parts of plants, beside the corolla of the flowers, *e. g.* the calyx, bractea, the coloured leaves of plants, fruits, and surface of the roots, all which comported themselves as the corresponding coloured Chromules of the flowers do.

Litmus presented a solitary example, but a very interesting one in this inquiry, of a substance abounding largely in Erythrogen, but containing no Xanthogen.

A table was also presented, exhibiting the general facts relative to the power of sulphurous acid in decolorizing the Chromules of plants. This acid, whether employed in its gaseous or liquid form, does not decolorize the Chlorophyle of leaves. It does not affect white flowers. It did not decolorize any one of about a score of yellow flowers submitted to its action. Of thirty or forty red flowers it decolorized all, with the exception of two or three. Of twenty blue flowers, two, the *Commelina cœrulea,* and the blue *Centaurea Cyanus,* resisted its blanching power. It decolorized some of the orange-coloured flowers, but rendered others of them of a bright yellow: it decolorized all the purple flowers that were tried, with the exception of purple *Centaurea Cyanus,* which it rendered blue, and the purple *Scabiosa atropurpurea,* which it reddened. It affected the tinted Chromule occurring in other parts of plants than blossoms; it completely blanches the internal leaves of the red cabbage, which are of a bright purple red, while it renders the external bluish-purple leaves green. It turned to green various leaves, which possessed red tints, whether general over the whole leaf, as the red beet, or partially diffused, as in some species of Dracæna. It decolorizes some fruits, while others resist its action.

Along with the general facts, the various hypotheses respecting the origin of the different Chromules, and sources of the differences amongst them, the autumnal coloration of leaves, &c., were brought under consideration.

Lastly, a detail was given of the influence of light in the production of different Chromules, shewing that it is indispensable for the production of the Chlorophyle of leaves, and the tinted Chromules formed during the autumnal coloration of the same parts; and that it is not indispensable for the formation of some of the finest tints of flowers and fruits, if essential for any.

The paper terminated with the following general conclusion: That there exist in plants two distinct colourable principles, two species of Chromogen, one which generates red compounds with acids, and denominated Erythrogen; and another which forms yellow compounds with alkalies, called Xanthogen. That these two principles occur together in red and blue flowers, and in the leaves of a few plants which exhibit the former of these tints; that all green leaves, all white and all yellow flowers, and white fruits, contain Xanthogen alone; that Litmus abounds in Erythrogen, but has no Xanthogen; that the Chromules of different tints may be generally considered distinct vegetable principles, or compounds having their own proper hue; sometimes intimately blended, or chemically combined with Chromogen; at other times having no connexion with it; that they are also occasionally, but not frequently, compounds of Chromogen with acids or alkalies.

The second part of the paper will comprehend an inquiry into the special character and properties of the two colourable principles, the Erythrogen and Xanthogen.

## 2. On Dyspnœa, and other Sensations experienced on the summit of Mont Blanc. By Martin Barry, M. D. Communicated by Dr Alison.

Thirst and loss of appetite were the first symptoms experienced by Dr Barry at a height of about 14,000 feet; but it was not till he reached a height 1000 feet greater, that exhaustion and fatigue supervened. A tendency to fainting was felt, and a total indifference to the main object of the journey. After a few minutes of rest, these sensations disappeared, but were again perceived on proceeding a few steps. On the summit (15,666 feet above the sea; Barom. 17.052, Detached Therm. 30°) no particular lassitude was felt while the author performed his experiments. After the descent the author did not suffer from a state of collapse.

It was shewn, that of those who have ascended Mont Blanc and other high mountains, some have suffered more, others less,—that there have been differences in this respect, not only among individuals of the same party at the same time, but in the same person at different times; how far referrible to the condition of the system, and how far to atmospheric changes, is still uncertain.

Respiration, and even continued muscular exertion, which necessarily accelerates the breathing, are possible in very attenuated air, as among the inhabitants of lofty regions; but by any great and sudden change of density, whether of increase or diminution, this function becomes embarrassed.

There is reason to believe that the quantity of oxygen *absorbed* by the lungs does not always bear the same ratio to the quantity *received* into their cells. At least, if the evolution of animal heat is directly as the oxygen *absorbed;* for on this supposition the air at Chamoni having a density = 27, that on the summit of Mont Blanc = 17, and the temperature at the upper station being many degrees below that at the lower, the absorption of oxygen must have been, not relatively alone, but also absolutely greater, from the rarer than from the denser air.

The occurrence of hæmorrhages in the ascent of high mountains has been a frequent, but very variable phenomenon, and some of these have probably been simply mechanical effects of the internal and external pressures not being at first in equilibrio.

3. Mr Smith of Jordanhill made a verbal communication regarding a change in the Relative Levels of the land and sea on the west coast of Scotland; recent shells having been found even at the height of 70 feet.

4. Professor Forbes communicated the following memorandum respecting the Polarization of Heat.

" I have recently ascertained the following facts respecting heat.

" 1st, That heat polarized in any plane, and then reflected from the surface of a refracting medium, changes its plane of polarization in a manner similar to what obtains in the case of light. Thus, with a thick plate of mica, which polarized homogeneous red light most completely at an incidence of about 59°, the plane of polarization of reflected polarized heat remained on the *same* side of the plane of reflection when the incidence was *great*, and was on the *contrary side* when the incidence was *small*. The limiting angle of incidence was about 57°, which therefore should be the polarizing angle of dark heat for mica. This mode of observing the polarizing angle offers some advantages above more direct methods.

" 2dly, Metals polarize heat extremely feebly by reflection. I have carried my experiments up to 85° from silver, yet even there but a small share is polarized. The effect is, however, distinctly recognizable through a considerable range of incidences. The effects are such as would indicate the maximum polarizing angle to be even much higher; perhaps it never attains a maximum. This fact corresponds to that in the case of light, except that the maximum polarizing angle is 73° (Brewster). Did metals act on light like other bodies, we should conclude, from the polarizing angle being greater, that heat is more refrangible than light. An important remark of Sir D. Brewster's, however, shews the statement I have made to be in conformity with the views of the nature of heat which I have published. He finds the maximum polarizing angle to be *greatest* for the *least* refrangible rays.

" 3dly, Heat polarized in a plane inclined 45° to the plane of subsequent reflection at silver, has its nature changed as in the case of light, and presents the conditions of elliptic polarization, though the ellipse is much more elongated, even at great angles of incidence.

"4thly, *Two* reflections from silver increase the polarizing effect of metals. This fact has its counterpart in light. Two reflections likewise produce an increased tendency to circular polarization when the plane of reflection is inclined 45° to that of primitive polarization. This effect increases with the obliquity of incidence up to considerable angles.

"These observations have been verified in the case of heat from various sources, obscure as well as luminous."

### *Monday 4th April.*

Dr HOPE, Vice-President, in the Chair.

The following Donations were presented:

Transactions of the Geological Society of London (second series). Vol. iv. Part 1.

Proceedings of the Geological Society of London, Nos. 42, 43 and 44.—*By the Society.*

Bulletin de la Société Géologique de France. Tome vii. Feuilles 1–2.—*By the Society.*

Tables des Positions Géographiques des Principaux Lieux du Globe; par M. Daussy.

Second Mémoire sur les Marées des Cotes de France; par M. Daussy.—*By the Author.*

The following Communications were read:

1. On Paracyanogen and its Compounds. By James F. W. Johnston, Esq.

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In this paper the author shewed that pure dry bicyanide of mercury, when heated in close vessels, gave off mercury and pure cyanogen only, yet that there remained always in the retort a portion of a black substance of variable density and lustre. He then proceeded, by a new series of analyses, to confirm what he had stated several years ago, that this black substance is identical in composition with cyanogen, being, like that gas, represented by the formula $NC_2$. To this solution he gives the name of Paracyanogen. He then stated that the black substance deposited in strong prussic acid, by a solution of cyanogen in water, in alcohol, in solution of caustic ammonia or caustic potash, after heating to redness, had the same composition. The black matter from solution of cyanogen in alcohol may be obtained in large quantity, by saturating the same portion of alcohol with cyanogen gas day after day as the odour of the gas disappears; a pint of alcohol being capable of absorbing the whole of the cyanogen given off by four or five pounds of bicyanide of mercury, becoming black and thick like treacle. The deposit collected on the filter dissolves readily in solution of caustic potash, and is precipitated by acids of a dark brown colour. In this state it appears to have the composition represented by $H+N_2C_3$. When heated to redness in close vessels, it gives off carbonate of ammonia, and leaves paracyanogen, according to the formula

$$HN_2C_3 + 2\,HO = NC_2 + (H_3N + CO_2).$$

The paracyanogen dissolves in sulphuric acid giving a dark brownish-red solution, from which water precipitates it unchanged. Boiled in the acid, carbonic and sulphurous acids are given off, and a partial oxydation of the paracyanogen takes place. Nitric acid, either cold or hot, acts very slightly on the paracyanogen from bicyanide of mercury, but dissolves readily in the cold, that prepared by the other processes, giving a dark reddish-brown solution, from which water precipitates the paracyanogen apparently unchanged. Hot nitric acid, however, dissolves the black substance from cyanogen in alcohol, &c. with evolution of copious red fumes, giving a bright reddish-yellow, or a pale amber-yellow solution, from which water precipitates a beautiful bright yellow powder. This yellow substance is *paracyanic acid.*

This acid is chiefly characterized by its great stability. It dissolves in nitric and sulphuric acids, and is very easily decomposed, even when boiled in these menstrua. When heated in a close vessel, it gives off carbonic acid and nitrogen, and leaves paracyanogen. Another very marked character is its affinity for the oxides of mercury. A solution of the paracyanic in concentrated nitric or sulphuric acid is precipitated largely and immediately by nitrates and sulphates of mercury. The salt of mercury, too, is only partially decomposed by boiling in these acids. The salt of silver is more soluble, but may also be obtained by adding dry nitrate of silver to a solution of the acid in concentrated nitric acid. These salts constitute yellow powders more or less bright; they seem also susceptible of crystallization. From the analysis of the acid and its salt of silver, the author considers the acid to be composed of $N_4C_8 + O$. The investigation, however, is still incomplete, and this composition is only given as probable and open to correction.

Like cyanogen, *para*cyanogen seems capable of uniting with the metals to form paracyanides, though, from its insolubility in ordinary menstrua, it is not easy to obtain them free from paracyanates.

### 2. On the newly discovered microscopic Entozoon infesting the Muscles of the Human Body. By Dr Knox.

The author commenced his observations by remarking that this very interesting entozoon was discovered in 1833, by Mr Hilton, who first saw the cysts enclosing the worms, and supposed them to be cysticerci. Shortly thereafter, Mr Paget discovered the worm itself. Further information was given in two excellent memoirs by Dr Farre and Mr Owen; and to the views of the former of these gentlemen the author chiefly leans.

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Throughout the observations, he endeavours to shew, that the origin of this entozoon is very obscure, and is not referrible to any known bodily ailment or mode of life. He differs also from preceding observers, both in respect to the form of the cyst, its structure, and its connexions; the form he makes out to be oval, the structure distinctly granular and not cellular, that is, not composed, as some have conjectured, out of the surrounding cellular tissue; and the connexion not *universal*, but towards the extremities. He conjectures also, that the granular structure discovered by him on the exterior of the cysts may be the germs of future individual worms and cysts.

The aged person, whose muscles after death presented these entozoon in such numbers, was quite healthy until a short period before her demise.

### *Monday* 11*th April* 1836.

Dr ABERCROMBIE, Vice-President, in the Chair.

The following Donations were presented:

The Statutes of the Realm. Vols. ii. to ix. and 2 vols of Indices.

Foedera, Conventiones, Litteræ, et cujuscunque Generis Acta Publica, inter Reges Angliæ et alios quosvis Imperatores, Reges, &c. Cura et studio Thomæ Rymer. 3 vols. in 6.

The Parliamentary Writs and Writs of Military Summons, together with the Records and Muniments relating to the Suit and Service due and performed to the King's High Court of Parliament, and the Councils of the Realm. Collected and Edited by Francis Palgrave, Esq. 2 vols. in 4.

Rotuli Scotiæ in Turri Londinensi et in Domo Capitulari Westmonasteriensi asservati. 2 vols.

Rotuli Hundredorum Temp. Hen. III. et Edw. I. in Turr. Lond. et in Curia Receptæ Scaccarii Westm. asservati. 2 vols.

Rotulorum Originalium in curia Scaccarii Abbreviatio. 2 vols.

Rotuli Litterarum Clausarum in Turri Londinensi asservati. Accurante Thoma Duffus Hardy. Vol. i.

Rotuli Litterarum Patentium in Turri Londinensi asservati. Accurante Thoma Duffus Hardy. Vol. i. pt. 1.

Calendarium Inquisitionum post Mortem sive Escaetarum. Vols. i. ii. iii. iv.

Nonarum Inquisitiones in Curia Scaccarii. 1 vol.

Placita de quo Warranto temporibus Edw. I. II. et III., in curia Receptæ Scaccarii Westm. asservata.

Placitorum in Domo Capitulari Westmonasteriensi asservatorum Abbreviatio.

Ducatus Lancastriæ. Vols. i. ii. iii.

Valor Ecclesiasticus Temp. Henr. VIII. auctoritate Regia institutus. 6 vols.

Calendars of the Proceedings in Chancery in the Reign of Queen Elizabeth; from the originals in the Tower. 3 vols.

Inquisitionum in Officio Rotulorum Cancellariæ Hiberniæ asservatarum Repertorium. 2 vols.

Rotulorum Patentium et Clausorum Cancellaria Hiberniæ Calendarium. Vol. i. part i.

Catalogue of the Harleian Manuscripts in the British Museum. 4 vols.

Catalogue of the Lansdowne Manuscripts in the British Museum, 1 vol.

Rotuli Curiæ Regis. Rolls and Records of the Court held before the King's Justiciars or Justices. Edited by Sir Francis Palgrave, K. H. 2 vols. 8vo.

Rotuli de Oblatis et Finibus in Turri Londinensi asservati tempore Regis Johannis. Accurante Thoma Duffus Hardy, S. A. S.

Fines, sive Pedes Finium: sive Finales Concordiæ in Curia Domini Regis: A. D. 1195—A. D. 1214. Edente Josepho Hunter. Vol. i.

Excerpta a Rotulis Finium in Turri Londinensi asservatis, Henrico Tertio Rege, A. D. 1216—1272. Cura Caroli Roberts. Vol. i. A. D. 1214—1246.

Rotuli Normanniæ in Turri Londinensi asservati, Johanne et Henrico Quinto Angliæ Regibus. Accurante Thoma Hardy, S. A. S.

Proceedings and Ordinances of the Privy Council of England. Edited by Sir Harris Nicolas. 10 Richard II. 1306 to 21 Henry VI. 1443. 5 vols.

General Introduction to Domesday Book, by Sir Henry Ellis, K. H., F. R. S.

*Presented by the Commissioners on Public Records.*

Transactions of the Society instituted at London for the Encouragement of Arts, Manufactures, and Commerce. Vol. 1. part 2. *By the Society.*

The Third Annual Report of the Royal Cornwall Polytechnic Society. *By the Society.*

The following Communications were read:

### 1. On the Origin of the Adjective. By Professor Pillans.

The principal object of this paper was to exhibit the manner in which, in the early stages of the history of language, the adjective may be supposed to have originated from the noun. Before stating his views of this subject, the author dwelt at some length on the universal principle which influences the formation of all languages, according to which man, when he has once acquired a small stock of words, will have recourse to all manner of expedients to save himself the invention of new terms; and an instance was given in the various applications of the derivatives and compounds of the Latin word *Calx*. In following out this principle, it seemed not unlikely that when the savage met, in a new substance, with a quality which formed the distinguishing character of an object he was already familiar with, he would apply the *noun* or name of that familiar object, to express the attribute or quality as he found it to exist in that which was quite new to him; so that, supposing the plant *wormwood* to be well-known to him, and the *bitter* orange not at all, he would, on falling in with that fruit, and tasting it, exclaim, this orange is *wormwood*; and the latter term might thus come to be established as the expression of that peculiar sensation wherever it was found, and even to lose, in many cases, its original substantive application. Various examples were given from our own language, all tending to prove how apt the mind is to employ the names of objects, not only to denote the aggregate of properties which makes up the notion of that object, but occasionally also to express its predominant and distinctive quality as it exists in a different substance, which has no other attribute in common with it.

## 2. On Single and Correct Vision by means of Double and Inverted Images on the Retinæ. By Dr Alison.

The author began by endeavouring to state with precision the nature of the difficulty which has been long felt on this subject. Two general facts are well ascertained, and present fair objects of inquiry, 1. That images formed on corresponding points of the retinæ of the human eyes, *and on these only*, naturally affect the mind in the same manner as a single image, formed on the retina of either eye; and, 2. That impressions made on different points of the retina of the eye, are naturally followed by inferences as to the relative position of the objects producing them, exactly opposite to those which follow impressions made on different points of the surface of the body.

Facts observed by Dr Reid and others, and confirmed by personal observation, appear to the author quite sufficient to shew, in opposition to the opinion of Berkeley and of Dr Brown, that these phenomena cannot be explained by reference to experience and association; and the law of visible direction, regarded by some as *an explanation*, is in fact only a general *expression* of these phenomena; and Dr Reid distinctly stated, when he laid down that law, that a farther step was to be expected, and " a more general law of vision might be discovered," if we should come to know " the structure and use of the choroid membrane, the optic nerves and brain, and what impressions are made *on them* by means of the pictures on the retinæ."

The theory of Newton, which ascribes single vision by images formed on *corresponding points of the retina*, to the circumstance of the corresponding points of the retina being connected (by means of a semi-decussation of the optic nerves at their commissure), with the *same points in the sensorium*, was next considered, and stated to be perfectly satisfactory, if the anatomical facts are as the theory supposes. The proof of the actual connexion of corresponding points of the retinæ, with the same points in the corpora quadrigemina or optic lobes (which physiological, still more than anatomical facts, point out as the true origin of the optic nerves), is still defective; but several facts stated on the subject by Wollaston, Mayo, Serres, and others, tend to support the theory.

In regard to correct vision by means of inverted and reverted images on the retina of the eye, the author stated, and endeavoured to shew by preparations, (what was first suggested to him by Mr Dick, veterinary surgeon,) that at least in the mammalia, and probably also lower in the scale of animals, the peculiar convoluted course of the *tractus optici*, and the mode of their implantation into the optic lobes, are such, that although the impressions made on *the retina* by the different parts of an object are necessarily, by the laws of optics, situated in regard to one another in the *inverse* order of those made on the surface of the body, yet the impressions made *through the retina* and optic nerves on the *optic lobes* (*i. e.* on the upper extremity of the cerebro-spinal axis) are in *the same* order as those made through the nerves of touch, on that central portion of the nervous system, on which the sensibility of all nerves depends; and therefore that the notions which we form of the relative position of the parts of objects by the senses of sight and touch will naturally correspond.

But although this seems sufficient to explain how the impressions made by any object of sight on *either optic lobe* are in the same order as those made on the sense of touch, yet in all animals which use both eyes in looking at an object, and (by reason of the partial decussation) both optic lobes in looking with one eye, another difficulty presents itself. The impressions made on *each lobe* are in the right order, but those made on the two lobes are transposed; those made by the left portion of the field of vision, even of a single eye, falling on the right side of the retina, and being transferred to the right optic lobe, and *vice versa*. The error which would thence result, the author thinks, is rectified by means of another piece of structure, the use of which has never been explained, viz. the decussation at the pyramidal bodies, whereby, as is generally believed, the whole sensation and voluntary motion of the left side of the body are placed in connexion with the right side of the brain, and *vice versa*.

Accordingly, it appears, that in those animals where the partial decussation of the optic nerves exists, making the sensations of each eye dependent on both optic lobes, (viz. in all the mammalia and birds,) the decussation at the pyramids also exists, according to the observations of Cuvier, Serres, and others; and the sensation and motion of either side of the body appear from the experiments of Flourens and others, as well as from observations of the effects of injury or disease, to be dependent on the other side of the brain; whereas in reptiles and fishes, where there is no commissure of the optic nerves, and one optic lobe only is concerned in the vision of one eye, there is no decussation at the pyramids, and no crossing effect of injury of the brain, to the opposite side of the body, has been observed.

If this speculation be well founded (and it is admitted that farther anatomical inquiries are requisite to justify a decided opinion upon it), the peculiar course and mode of implantation of the optic nerves, in most if not all animals, and the partial decussation of the optic nerves, and the decussation at the pyramids in the two higher classes, are all parts of the arrangement by which Nature brings the intimations given by the sense of Sight, which are of course partly regulated by the laws of light, into harmony with those given by the sense of Touch, which have no connexion with these laws; and enables those animals that use both eyes at once, to derive correct information as to the number and position of objects from the sensations simultaneously excited in both, notwithstanding that the images which are essential to these sensations are double, inverted, and reverted.

### *Monday*, 18*th April* 1836.

Sir T. M. BRISBANE, Bart. President, in the Chair.

The following gentlemen were duly elected ordinary Fellows of the Society:

1. Martin Barry, M. D.
2. Robert Steuart, Esq. M. P.

The following donations were presented:

Nouveaux Mémoires de l'Academie Royale des Sciences et Belles Lettres de Bruxelles. Tome ix.

Mémoires couronnés par l'Academie Royale des Sciences et Belles Lettres de Bruxelles. Tome x.

Bulletin de l'Academie Royale des Sciences et Belles Lettres de Bruxelles. 1835. Nos. 8, 9, 10, 11, 12.

Annuaire de l'Academie Royale des Sciences et Belles Lettres de Bruxelles. 1836.—*By the Academy.*

Annuaire de l'Observatoire de Bruxelles pour l'An 1836. Par le Directeur A. Quetelet.

Compte de l'Administration de la Justice Criminelle en Belgique pendant les Années 1831, 1832, 1833, et 1834, presenté au Roi par le Ministre de la Justice. 1835.—*By M. Quetelet.*

Astronomische Nachrichten. Nos. 289 to 294.—*By M. Schumacher.*

Du Spiritualisme au xix$^{me}$ Siècle, ou Examen de la Doctrine de Maine de Biran, par L. A. Gruyer.—*By the Author.*

Institut Royal de France pour l'An 1836.—*By the Institute.*

The American Journal of Science and Arts; conducted by Benjamin Silliman, M. D., LL. D., &c., for January 1836.—*By the Editor.*

On the Occurrence of the Megalichthys in a Bed of Cannel Coal in the West of Fifeshire, with Observations on the supposed lacustrine Limestone at Burdiehouse.—*By Leonard Horner, Esq.*

On an artificial Substance resembling Shell; by Leonard Horner Esq. With an Account of an Examination of the same; by Sir David Brewster, LL. D. With Specimen of the substance. —*By Leonard Horner, Esq.*

The following communication was read :—

### Observations on the Chemical Nomenclature of Inorganic Compounds. By Dr Hope.

The object of this paper is to propose a modification of the nomenclature of inorganic compounds now in use among chemists, which shall display with accuracy the ingredients of each compound, and the atomic ratios of each ingredient.

After stating the introduction of the principle of employing a descriptive nomenclature in chemistry by Bergman, and the happy application of it by Lavoisier and his associates, and subsequently by Berzelius, he traced the various changes rendered necessary by the improved knowledge of the more intimate constitution of compounds, resulting from the discovery of combination in definite proportions, and the atomic ratios in which combinations take place, adopted by Wollaston, Thomson, Thenard, Turner, &c. He next pointed out several imperfections in the nomenclature now in use in chemical writings, and explained a modification of it which he conceived to be more precise, completely descriptive, and admitting of application to every case and proportion of combination.

He suggested, 1st, That the prefixes of proto, per, super, and sub, now in common use, should be discontinued, as unnecessary,—as possible sources of confusion—and as deviating from the sound rule, of employing numerals of the same order and language to denote a continued series of any compound.

2d, That the happy suggestion of Dr Thomson, of employing the Greek adverbial numerals to denote the number of atoms or equivalents of base, and the Latin the number of atoms of oxygen, acid, &c. should be adopted.

3d, That the interweaving of the Latin and Greek atomic numerical indications in the same word ought to be avoided as much as possible.

The following tabular views of the nomenclature of oxides, and of metallic salts, were given as specimens of the nomenclature of the more simple and more complicated combinations.

TABLE I.

| Atom of Metal. | | Atom of Oxygen. | | Oxide. |
|---|---|---|---|---|
| 1 | + | 1 | ... | Oxide of Metal. |
| 1 | + | 2 | ... | Bis Oxide of Metal. |
| 1 | + | 3 | ... | Ter Oxide of M. |
| 1 | + | 4 | ... | Quater Oxide of M. |
| 2 | + | 1 | ... | Dis Oxide of M. |
| 3 | + | 1 | ... | Tris Oxide of M. |
| 4 | + | 1 | ... | Tetrakis Oxide of M. |
| 2 | + | 3 | ... | DisTer Oxide of M. |
| 2 | + | 5 | ... | Dis Quinquoxide of M. |

TABLE II.

| Oxide. | | Acid. Sulphuric. | | Compound Salt. |
|---|---|---|---|---|
| 1 | + | 1 | ... | Sulphate of Metal. |
| 1 | + | 2 | ... | Bis Sulphate of M. |
| 1 | + | 3 | ... | Ter Sulphate of M. |
| 1 | + | 4 | ... | Quater Sulphate of M. |
| 2 | + | 1 | ... | Dis Sulphate of M. |
| 3 | + | 1 | ... | Tris Sulphate of M. |
| 4 | + | 1 | ... | Tetrakis Sulphate of M. |

| Atom of Bis Oxide. | Acid. | Atom of Sulphuric. | | Compound Salt. |
|---|---|---|---|---|
| 1 | + | 1 | ... | Sulphate of Bis Metal. |
| 1 | + | 2 | ... | Bis Sulphate of Bis M. |
| 2 | + | 1 | ... | Dis Sulphate of Bis M. |
| Ter Oxide. | | | | |
| 1 | + | 1 | ... | Sulphate of Ter Metal. |
| 1 | + | 2 | ... | Bis Sulphate of Ter M. |
| 1 | + | 3 | ... | Ter Sulphate of Ter M. |
| 2 | + | 1 | . | Dis Sulphate of Ter M. |
| Dis Oxide. | | | | |
| 1 | + | 1 | ... | Sulphate of Dis Metal. |
| 1 | + | 2 | ... | Bis Sulphate of Dis M. |
| 2 | + | 1 | ... | Dis Sulphate of Dis M. |
| Tris Oxide. | | | | |
| 1 | + | 1 | ... | Sulphate of Tris Metal. |
| 1 | + | 2 | ... | Bis Sulphate of Tris M. |
| 2 | + | 1 | ... | Dis Sulphate of Tris M. |
| DisTer Oxide. | | | | |
| 1 | + | 1 | ... | Sulphate of DisTer Metal. |
| 1 | + | 2 | ... | Bis Sulphate of DisTer M. |
| 2 | + | 1 | ... | Dis Sulphate of DisTer M. |

He called the attention of the Society to an apparent deviation from the principle of the nomenclature, which he adopted for the sake of abbreviation, while it cannot possibly create any confusion. When speaking of the combination of an acid, *e. g.* the sulphuric with an oxide of a metal, say iron, the atomic constitution of which is one atom of metal and one of oxygen, he calls the compound sulphate of iron, not sulphate of oxide of iron, because every chemist is aware that invariably the metal is in the state of an oxide when in union with an acid.

He concluded by inculcating the importance of chemical writers and teachers employing uniformly the same nomenclature, and expressing his hope that the modification now proposed may meet the approbation of his fellow-labourers in the Edinburgh School.

2. Mr Stark read a communication from Dr Parnell on the occurrence of the Clupea alba, or White Bait, and of the Raniceps trifurcatus, or Tadpole-fish, in the Frith of Forth. Specimens were exhibited.

Dr Parnell endeavoured to state the specific characters by which

**the white bait may be distinguished from the shad, the herring, the sprat, and the pilchard.**

**In the white bait, the tongue and roof of the mouth are furnished with three or four rows of distinct teeth; these parts in the shad are destitute of teeth.**

**The dorsal fin of the herring is placed half way between the point of the upper jaw, and end of the long caudal rays; the same fin in the white bait is situated much nearer the tip of the tail than to the point of the upper jaw; the body is more compressed, of a lighter colour, and the belly is much rougher to the touch, under the pectorals, than is observed in the herring.**

**The origin of the ventral fins, in the sprat, is placed before the first dorsal ray; in the white bait, it is situated behind the third dorsal ray.**

**The pilchard has its dorsal fin placed exactly in the centre of gravity, so that, when the fish is held up by the anterior rays, the body preserves an equilibrium; whereas, if the white bait be taken up by the same part, the head will be observed to dip considerably.**

3. Account of a Visit to the Governor of the Chinese Frontier Town of Mai-ma-tchin, bordering with Kiachta, in Siberia. By a General Officer in the Russian Service. Communicated by Mr Robison, Sec. R. S. Edin.

*Monday, 2d May* 1836.

SIR T. M. BRISBANE, Bart. President, in the Chair.

The following gentlemen were duly elected Ordinary Fellows of the Society:

1. **Archibald Robertson, M. D., F. R. S.**
2. **J. Macpherson Grant, Esq. younger of Ballindalloch.**
3. **Alexander Gibson Carmichael, Esq.**
4. **Edward Sang, Esq.**
5. **Rev. Professor Nichol.**

The following Donations were presented:

**Tijdschrift voor Natuurlijke Geschiedenis en Physiologie uitgegeven door J. van der Hoeven, M. D., en W. H. de Vriese, M. D. Deel ii. Stuk. 4.—*By the Editors.***

**A Memoir of the late Lewis David Von Schweinitz, P. D., with a Sketch of his Scientific Labours. Read before the Academy**

of Natural Sciences of Philadelphia, May 12. 1835.—*By Walter R. Johnson.*

A Biographical Sketch of the late Thomas Say, Esq. Read before the Academy of Natural Sciences of Philadelphia, December 16. 1834. By Benjamin H. Coates, M. D.—*By the Academy.*

Tables of Continental Lineal and Square Measures. By W. S. B. Woolhouse, Head Assistant of the Nautical Almanac Establishment.—*By the Author.*

Prepared Specimens of the following Species of Fish were presented by Dr Parnell:

Trigla Blochii.
Aspidophorus cataphractus.
Gasterosteus trachurus.
Blennius Pholis.
Zoarcus viviparus.
Belone vulgaris.
Clupea Harengus.
Clupea sprattus.
Clupea alba.
Salmo eriox.
Salmo fario—Male.
Salmo fario—Female.
Salmo salmulus.
Gadus luscus.
Platessa vulgaris.
Platessa flesus.
Platessa pola.
Microcephalus petrosus.
Platessa Limandoides.
Solea vulgaris.
Raia radiata.

The following papers were read:

1. An Attempt to ascertain the Relative Positions of the Athenian and Syracusan Lines before Syracuse, from the Description of Thucydides. By Professor Dunbar.

The object of this paper was to ascertain the position of the Athenian and Syracusan lines from the language employed by Thucydides, particularly the prepositions. The author was led to examine the account of these lines given by *Goellen* and Dr Arnold, in their editions of Thucydides, and the maps they have subjoined, and to compare them with the historian's descriptions. He pointed out the error into which both seem to have fallen, respecting the fortifications of Temnites, as it did not appear, from the historian's statement, that the district was entirely inclosed, but only that part fronting Epipolæ. He also endeavoured to shew that the cross wall, built by the Syracusans, to intercept the Athenian lines in the direction of Trogilus, could not have been constructed on the south of the Temnites, as Dr Arnold supposes, but on the north of the slope of Epipolæ, and that it was not entirely destroyed by the Athenians.

The direction and nature of the third counter-work of the Syracusans he supposed were also misunderstood by *Goellen*, Dr Arnold, and other commentators and editors. It did not appear to have been carried in a direction to cut the Athenian lines of circumvallation towards Trogilus, but, after it had reached a certain length in the direction of their wall, it was then carried northwards, and *parallel* to the Athenian lines; and this appeared evident from the language employed by the historian, in his description of the battles that were fought between the lines of both parties; and the use of the preposition παρὰ in composition with the verbs οἰκοδομέω and ἔρχομαι. He also shewed that this parallel wall was afterwards carried forward to the ἐγκάρσιον τεῖχος, or cross wall. The author then described the position of the three Syracusan camps on Epipolæ, which were attacked by Demosthenes, in the night expedition to turn the Syracusan lines, and pointed out the errors into which Dr Arnold seems to have fallen, in his account of them, as also the misapplication of the term παρατείχισμα, which he thinks should be προτείχισμα, or an advanced post. He concluded by observing, that the rout of the Athenians must have commenced near the verge of the slope of Epipolæ, and not towards the bottom, as has been generally supposed.

## 2. Researches on Heat. Second, Series. By Professor Forbes.

The author states, that in a former paper on this subject, having confined himself to the establishment of a number of new facts in the science of heat, embracing its polarization by reflection, refraction, and double refraction, and the depolarizing action of doubly refracting crystals, he proceeded, on resuming the subject, to ascertain more accurately the laws of these phenomena.

The *first* section of the paper relates to the methods of observation employed, and the examination of the values of the degrees of the galvanometer, which, for the most part, do not indicate equal increments of force. Two tables are given. By the first, the *statical* deviations of the needle are reduced, so as to be measures of the force producing them; and, by the second, the *dynamical* effect, or arc moved over by the initial disturbing action, is reduced to the final or statical effect, and thence to the true measure of heat. Several peculiarities attendant on the use of the galvanometer are kewise discussed.

In the *second* section, the observations formerly published on the polarizing action of tourmaline are confirmed, including the case where heat entirely dark was employed. Of all the observations this alone has been attended with any difficulty in the verification.

The *third* section treats of the laws of the polarization of heat by refraction or transmission. The author denies that the results given in the first series of these researches were held out as numerically accurate; and he took occasion to state verbally, that whilst an attempt has been made to depreciate the credit due to his observations, on the ground of the numerical inaccuracy of his first results, the objectors themselves seem to have fallen into a graver mistake, that of considering all kinds of heat equally polarizable at the same angle of incidence. A great number of experiments have confirmed the opinion which the author formerly entertained, that heat from non-luminous sources is less polarizable by a given plate of mica at a given angle of incidence than when accompanied by light. He has constructed polarizing mica bundles of great tenuity, by using sudden heat to split that substance into a vast number of minute laminæ. With one pair of such plates he obtained the following percentages of heat *stopped* when the planes of refraction in the two bundles were rectangular:

| Sources of Heat. | Rays out of 100 polarized. |
|---|---|
| Argand lamp, | 72 to 74 |
| Incandescent platinum, | 72 |
| Heat from brass about 700°, | 63 |
| Do. transmitted through glass, | 72 |
| From mercury in a crucible at 410°, | 48 |
| From boiling water, | 44 |

These observations were repeatedly made, and were confirmed by others made with a different pair of mica plates. The results are shewn to agree with those obtained in the case of light; the heat at the bottom of the list being the least refrangible.

In the *fourth* section the law of polarization by reflection is discussed. A number of reflecting surfaces were tried, and split mica was preferred. The amount of polarization, by reflection at a given angle, is shewn to vary with the source of heat; and it is probable that the kinds of heat do not rank in the same order when the angle is changed. This is the case in light. The change of the plane of polarization by subsequent reflection is similar to that which occurs when light is used. (See page 130.)